

CLAIMS

What is claimed is:

5 1. In a Foreign Agent supporting Mobile IP, a method of sending a registration request packet on behalf of a node that supports PPP but does not support Mobile IP, comprising:

 accepting a call from the node;

10 receiving authentication information associated with a PPP authentication protocol from the node, the authentication information enabling a PPP node to be authenticated;

15 obtaining a PPP node profile associated with the authentication information, the PPP node profile including registration information associated with the node that enables proxy registration to be performed by the Foreign Agent on behalf of the node, the registration information associated with the node identifying a Home Agent associated with the node;

 composing a registration request packet including the registration information associated with the node; and

 sending the registration request packet to the Home Agent on behalf of the node.

20 2. The method as recited in claim 1, wherein the authentication information includes a user ID submitted by the node during PPP authentication.

3. The method as recited in claim 1, wherein the authentication information includes a password submitted by the node during PPP authentication.

4. The method as recited in claim 1, wherein the PPP authentication protocol is PAP or CHAP.

5. The method as recited in claim 1, wherein the registration request packet includes an extension including the authentication information.

6. The method as recited in claim 1, wherein obtaining a PPP node profile comprises:

composing a request packet for the node, the request packet including the authentication information;

sending the request packet to a server, the server being adapted for performing authentication and for storing a profile for one or more nodes supporting PPP; and

receiving a reply packet from the server, the reply packet including at least a portion of a profile for the node.

7. The method as recited in claim 6, wherein the server is a TACACS+ or a RADIUS server.

8. The method as recited in claim 6, wherein the server is coupled to the Foreign Agent.

9. The method as recited in claim 6, wherein the server is coupled to a Home Agent associated with the node.

10. The method as recited in claim 1, the information associated with the node further identifying a key to be shared between the Home Agent and the Foreign Agent.

11. The method as recited in claim 1, the information associated with the node further identifying a service selection, the service selection indicating that PPP service is normal PPP service, mobile IP service, or proxy mobile IP service.

12. The method as recited in claim 11, wherein composing the registration request packet is performed in response to obtaining the PPP node profile in which the service selection indicates that PPP service is proxy mobile IP service.

13. The method as recited in claim 1, the information associated with the node further indicating a registration lifetime for the node.

14. The method as recited in claim 1, the information associated with the node further identifying a Home Address for the node.

15. The method as recited in claim 14, further comprising:

completing IPCP to establish and configure IP between the node and the Foreign Agent using the Home Address.

16. The method as recited in claim 1, further comprising:

receiving a registration reply from the Home Agent, the registration reply identifying a Home Address for the node.

17. The method as recited in claim 16, further comprising:

completing IPCP to establish and configure IP between the node and the Foreign Agent using the Home Address.

18. The method as recited in claim 1, further comprising:

receiving a registration reply from the Home Agent, the registration reply including a proxy Mobile Node registration sequence number extension indicating a sequence number for a registration being performed on behalf of the node by the Foreign Agent, the sequence number indicating an order of the registration within a sequence of one or more registrations performed by one or more Foreign Agents on behalf of the node.

19. The method as recited in claim 18, further comprising:

updating a registration table to associate the sequence number with the node.

20. The method as recited in claim 1, further comprising:

receiving a registration reply from the Home Agent, the registration reply including a proxy Mobile Node extension indicating whether a registration being

performed on behalf of the node is a re-registration by the Foreign Agent or an initial registration by the Foreign Agent.

21. The method as recited in claim 20, further comprising:

5 updating a registration table to indicate whether the registration being performed on behalf of the node is a re-registration by the Foreign Agent or an initial registration by the Foreign Agent.

22. The method as recited in claim 1, further comprising:

10 providing a sequence number in a proxy Mobile Node extension to the registration request, the sequence number indicating a registration being performed by the Foreign Agent on behalf of the node among a sequence of one or more registrations performed on behalf of the node.

15 23. The method as recited in claim 22, further comprising:

receiving a registration reply from the Home Agent, the registration reply including a proxy Mobile Node registration sequence number extension indicating an updated sequence number for the registration being performed by the Foreign Agent on behalf of the node.

20 24. The method as recited in claim 22, wherein the sequence number is zero when the registration is an initial registration being performed on behalf of the node.

25. The method as recited in claim 22, further comprising:

obtaining the sequence number from a registration table, the registration table identifying the node, a Home Agent associated with the node, and the sequence number.

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26. In a Home Agent supporting Mobile IP, a method of processing a registration request packet composed on behalf of a node that supports the Point-to-Point Protocol, comprising:

10 receiving the registration request packet from a Foreign Agent that is performing proxy registration on behalf of the node, the registration request packet including a registration indicator indicating whether registration being performed by the Foreign Agent on behalf of the node is a re-registration by the Foreign Agent or an initial registration by the Foreign Agent;

15 determining from the registration indicator whether to accept registration of the node with the Home Agent;

composing a registration reply packet indicating whether registration of the node with the Home Agent is accepted; and

sending the registration reply packet to the Foreign Agent.

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27. The method as recited in claim 26, further comprising:

indicating in a mobility binding table whether the registration is a re-registration by the Foreign Agent or an initial registration by the Foreign Agent.

28. In a Home Agent supporting Mobile IP, a method of processing a registration request packet composed on behalf of a node that supports the Point-to-Point Protocol, comprising:

receiving the registration request packet from a Foreign Agent that is performing proxy registration on behalf of the node, the registration request packet including a sequence number indicating an order within a sequence of one or more registrations performed by one or more Foreign Agents on behalf of the node;

determining from the sequence number whether to accept registration of the node with the Home Agent;

composing a registration reply packet indicating whether registration of the node with the Home Agent is accepted; and

sending the registration reply packet to the Foreign Agent.

29. The method as recited in claim 28, wherein the registration request packet comprises a proxy Mobile Node registration sequence number extension that includes the sequence number.

30. The method as recited in claim 28, further comprising:

determining from the sequence number whether the registration request packet corresponds to an initial registration of the node with the Home Agent;

when the sequence number indicates that the registration request packet corresponds to the initial registration of the node with the Home Agent, indicating in the registration reply packet that registration of the node with the Home Agent is accepted.

31. The method as recited in claim 30, further comprising wherein when the sequence number indicates that the registration request packet corresponds to the initial registration of the node with the Home Agent, incrementing the sequence number to create an updated sequence number, creating an entry in a mobility binding table associating the updated sequence number with the node, and providing the updated sequence number in the registration reply.

32. The method as recited in claim 28, further comprising:

obtaining the sequence number from the registration request packet;

obtaining a second sequence number associated with the node from a mobility binding table;

comparing the sequence number obtained from the registration request packet with the second sequence number;

when the sequence number obtained from the registration request packet is not equal to the second sequence number obtained from the mobility binding table, indicating in the registration reply packet that registration of the node with the Home Agent is denied; and

when the sequence number obtained from the registration request packet is equal to the second sequence number obtained from the mobility binding table, indicating in the registration reply packet that registration is accepted when re-registration is being performed by the Foreign Agent and otherwise indicating in the registration reply packet that registration is denied.

33. The method as recited in claim 32, wherein when the sequence number obtained from the registration request packet is equal to the second sequence number obtained from the mobility binding table further comprises:

5 comparing a first care-of address obtained from the registration request packet to a second care-of address associated with the node obtained from the mobility binding table;

when the first care-of address is not equal to the second care-of address, indicating in the registration reply packet that registration with the Home Agent is denied; and

10 when the first care-of address is equal to the second care-of address, indicating in the registration reply packet that registration with the Home Agent is accepted.

34. A computer-readable medium adapted for sending a registration request packet on behalf of a node that supports PPP but does not support Mobile IP, comprising:

15 instructions for accepting a call from the node;

instructions for receiving authentication information associated with a PPP authentication protocol from the node, the authentication information enabling a PPP node to be authenticated;

20 instructions for obtaining a PPP node profile associated with the authentication information, the PPP node profile including registration information associated with the node that enables proxy registration to be performed by the Foreign Agent on behalf of the node, the registration information associated with the node identifying a Home Agent associated with the node;

25 instructions for composing a registration request packet including the registration information associated with the node; and

instructions for sending the registration request packet to the Home Agent on behalf of the node.

35. An apparatus for sending a registration request packet on behalf of a node that supports PPP but does not support Mobile IP, comprising:

a processor; and

a memory, at least one of the processor and the memory being adapted for:

accepting a call from the node;

receiving authentication information associated with a PPP authentication protocol from the node, the authentication information enabling a PPP node to be authenticated;

obtaining a PPP node profile associated with the authentication information, the PPP node profile including registration information associated with the node that enables proxy registration to be performed by the Foreign Agent on behalf of the node, the registration information associated with the node identifying a Home Agent associated with the node;

composing a registration request packet including the registration information associated with the node; and

sending the registration request packet to the Home Agent on behalf of the node.

36. A Foreign Agent supporting Mobile IP, the Foreign Agent being adapted for sending a registration request packet on behalf of a node that supports PPP but does not support Mobile IP, comprising:

means for accepting a call from the node;

means for receiving authentication information associated with a PPP authentication protocol from the node, the authentication information enabling a PPP node to be authenticated;

5 means for obtaining a PPP node profile associated with the authentication information, the PPP node profile including registration information associated with the node that enables proxy registration to be performed by the Foreign Agent on behalf of the node, the registration information associated with the node identifying a Home Agent associated with the node;

10 means for composing a registration request packet including the registration information associated with the node; and

means for sending the registration request packet to the Home Agent on behalf of the node.